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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LERNER, MARTIN	

ART UNIT	PAPER NUMBER
2654	

DATE MAILED: 11/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/811,653	KLAKOW ET AL.
	Examiner	**Art Unit**
	Martin Lerner	2654

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _10 September 2004_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1 to 12_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1 to 12_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1 to 6, 8, and 10 to 12 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus")*.

3. Applicants cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

4. Claims 7 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by *Ramaswamy et al.*

Regarding independent claim 7, *Ramaswamy et al.* discloses a method of building language models for speech recognition, wherein:

"a text corpus part of a given first text corpus is gradually extended by one or various other text corpus parts of the first text corpus in dependence on text data of an application-specific text corpus to form a second text corpus that is iteratively extended until a predefined criterion achieves a substantially minimum value and in that the values of the language model are generated while the second text corpus from the last iteration is used" – language model constructor 50 reads linguistic units from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first text corpus") is constructed, iterative corpus extractor 60 reads linguistic units ("one or various text corpus parts") from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80; an iterative language model building technique generates a final language model 90 ("a second text corpus") from a small, domain-restricted seed corpus 15 ("in dependent on text data of an application-specific text corpus") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a common domain or field ("an application-specific text corpus"), and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus; final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2); a minimized perplexity change is "a predefined criterion achieving a substantially minimum value"; threshold comparator 63 accepts only those linguistic units that are below a perplexity threshold (column 4, lines 15 to 54: Figure 3); model checker 70 evaluates language model quality by using the size of the perplexity change; if the

perplexity score for the current iteration is higher than those from prior iterations, indicating a reduction in quality, then the language model building process may be considered complete (column 5, lines 6 to 34: Figure 4); thus, iterations continue until a predefined criterion, a size of perplexity change, is minimized.

Regarding independent claim 9, *Ramaswamy et al.* discloses a method of building language models for speech recognition, wherein:

"a part of a given acoustic training material, which represents a multitude of speech utterances, is gradually extended by one or more parts of the given acoustic training material and in that the acoustic references of the acoustic model are formed by means of the accumulated parts of the given acoustic training material once a predefined criteria achieves a substantially minimum value" – language model constructor 50 reads linguistic units ("one or more parts of the given acoustic training material") from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 is constructed, iterative corpus extractor 60 reads linguistic units from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80, and incrementally increases the size of the initial reference language model 80 ("is gradually extended by one or more parts of the given acoustic training material"); an iterative language model building technique generates a final language model 90 ("the acoustic model") from a small, domain-restricted seed corpus 15 and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a

common domain or field, and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus; final language model 90 is used in language processing applications (column 2, line 40 to column 4, line 7: Figures 1 and 2); minimizing perplexity change is "a predefined criterion achieves a substantially minimum value"; threshold comparator 63 accepts only those linguistic units that are below a perplexity threshold (column 4, lines 15 to 54: Figure 3); model checker 70 evaluates language model quality by using the size of the perplexity change; if the perplexity score for the current iteration is higher than those from prior iterations, indicating a reduction in quality, then the language model building process may be considered complete (column 5, lines 6 to 34: Figure 4); thus, iterations continue until a predefined criterion, a size of perplexity change, is minimized; implicitly, linguistic units are acoustic units in speech recognition.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, and 10 to 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*

Regarding independent claim 1, *Ramaswamy et al.* discloses a method of generating a language model for speech recognition, wherein:

"a first text corpus is gradually [reduced] by one or more various text corpus parts in dependence on text data of an application-specific second text corpus until a final text corpus is obtained from iterations of [reductions] of the first text corpus according to predefined criterion achieving a substantially minimum value" – language model constructor 50 reads linguistic units from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first text corpus") is constructed, iterative corpus extractor 60 reads linguistic units ("one or various text corpus parts") from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80; an iterative language model building technique generates a final language model 90 from a small, domain-restricted seed corpus 15 ("in dependence on text data of an application-specific second text corpus") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 ("an application-specific second text corpus") are all highly relevant to a common domain or field, and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus (column 2, line 40 to column 3, line 63: Figures 1 and 2); a minimized perplexity change is "predefined criterion achieving a substantially minimum value"; threshold comparator 63 accepts only those linguistic units that are below a perplexity threshold (column 4, lines 15 to 54: Figure 3); model checker 70 evaluates language model quality by using the size of the perplexity change; if the perplexity score for the current iteration is higher than those from prior iterations, indicating a reduction in quality, then the language model building process may be considered complete (column 5, lines 6 to 34: Figure 4);

thus, iterations continue until a predefined criterion, a size of perplexity change, is minimized;

"in that the values of the language model are generated on the basis of the [reduced] final text corpus" – final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2).

Regarding independent claim 1, *Ramaswamy et al.* discloses a method of building language models by iteratively increasing the size of a language model by adding units from a large external text corpus, where the added units are similar to linguistic units in a seed corpus. Thus, *Ramaswamy et al.* discloses gradually and iteratively increasing the size of the language model but omits gradually reducing the size of the language model by reductions. Still, one of ordinary skill in the art would recognize that the language model building method of *Ramaswamy et al.* might be reversed in order gradually to reduce the size of the language model instead of gradually increasing its size. That is, the large external text corpus 20 may be gradually reduced when linguistic units iteratively are compared to, and found to be different from, those in the seed corpus. *Bandara et al.* teaches a method for adapting the size of a language model in a speech recognition system, where an acoustic distance is calculated, and the contents of the language model are reduced with respect to acoustic distance. (Column 5, Lines 20 to 63: Figure 2) The stated advantage is the size of the language model is reduced, while retaining accuracy. (Column 3, Line 56 to Column 4, Line 24) It would have been obvious to one having ordinary skill in the art to reverse the language model building process of *Ramaswamy et al.* as suggested by *Bandara et al.*

for the purpose of reducing the size of the language model, while retaining recognition accuracy.

Regarding claim 2, *Bandara et al.* discloses calculating the language model parameters based upon trigram, bigram, and unigram probabilities (column 2, lines 20 to 67).

Regarding claim 5/1 and 5/2, *Ramaswamy et al.* discloses a test corpus ("test text") is used by model checker 70 to evaluate the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory (column 3, lines 6 to 14; column 3, line 64 to column 4, line 7).

Regarding claim 6/5/1 and 6/5/2, *Ramaswamy et al.* discloses iterative corpus extractor computes a relevance score based upon a perplexity measure relative to a threshold to determine how many linguistic units to add to the language model (column 4, lines 7 to 54).

Regarding independent claim 8, *Ramaswamy et al.* discloses a method of generating a language model for speech recognition, wherein:

"acoustic training material representing a first number of speech utterances is gradually [reduced] until a predefined criterion achieves a substantially minimum value by acoustic training material parts representing individual speech utterances in dependence on a second number of application-specific speech utterances" – language model constructor 50 reads linguistic units ("training material representing a number of speech utterances") from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first

number of speech utterances") is constructed, iterative corpus extractor 60 reads linguistic units from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80, and incrementally increases the size of the initial reference language model 80; an iterative language model building technique generates a final language model 90 from a small, domain-restricted seed corpus 15 ("in dependence on a second number of application-specific speech utterances") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a common domain or field, and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus (column 2, line 40 to column 4, line 7: Figures 1 and 2); implicitly, linguistic units are acoustic units in speech recognition; a minimized perplexity change is "a predefined criterion achieves a substantially minimum value"; threshold comparator 63 accepts only those linguistic units that are below a perplexity threshold (column 4, lines 15 to 54: Figure 3); model checker 70 evaluates language model quality by using the size of the perplexity change; if the perplexity score for the current iteration is higher than those from prior iterations, indicating a reduction in quality, then the language model building process may be considered complete (column 5, lines 6 to 34: Figure 4); thus, iterations continue until a predefined criterion, a size of perplexity change, is minimized;

"in that the acoustic references of the acoustic model are formed by means of the [reduced] acoustic training material" – final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2).

Regarding independent claim 8, *Ramaswamy et al.* discloses a method of building language models by iteratively increasing the size of a language model by adding units from a large external text corpus, where the added units are similar to linguistic units in a seed corpus. Thus, *Ramaswamy et al.* discloses gradually increasing the size of the language model but omits gradually reducing the size of the language model. Still, one of ordinary skill in the art would recognize that the language model building method of *Ramaswamy et al.* might be reversed in order gradually to reduce the size of the language model instead of gradually increasing its size. That is, the large external text corpus 20 may be gradually reduced when linguistic units iteratively are compared to, and found to be different from, those in the seed corpus. *Bandara et al.* teaches a method for adapting the size of a language model in a speech recognition system, where an acoustic distance is calculated, and the contents of the language model are reduced with respect to acoustic distance. (Column 5, Lines 20 to 63: Figure 2) The stated advantage is the size of the language model is reduced, while retaining accuracy. (Column 3, Line 56 to Column 4, Line 24) It would have been obvious to one having ordinary skill in the art to reverse the language model building process of *Ramaswamy et al.* as suggested by *Bandara et al.* for the purpose of reducing the size of the language model, while retaining recognition accuracy.

Regarding claims 10 and 11, *Ramaswamy et al.* discloses a method for generating a language model and acoustic models of linguistic units in speech recognition.

Regarding claim 12, *Ramaswamy et al.* discloses a method of building language models for speech recognition, wherein a language model constructor 50 generates a final language model 90 ("final text corpus") from a relatively small seed corpus 15 ("a small test corpus") (column 2, lines 40 to 50: Figure 1).

7. Claims 3, 4, 5/3, 5/4, 6/5/3, and 6/5/4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.* as applied to claims 1 and 2 above, and further in view of *Klakow ("Language-model optimization by mapping of corpora")*.

Concerning claim 3, *Ramaswamy et al.* discloses calculating a relevance score, but omits a selection criteria of the equation. However, *Klakow ("Language-model optimization by mapping of corpora")* discloses mapping of training corpora by an n-gram perplexity criterion involving the equation. (Page 702, Left Column) This is stated to have the advantage of reduced perplexity for speech recognition applications. (Page 701) It would have been obvious to one having ordinary skill in the art to apply the equation taught by *Klakow ("Language-model optimization by mapping of corpora")* as the relevance score of *Ramaswamy et al.* for the purpose of reducing perplexity in speech recognition applications.

Concerning claim 4, *Bandara et al.* discloses calculating the language model parameters based upon trigram, bigram, and unigram probabilities (column 2, lines 20 to 67).

Concerning claim 5/3 and 5/4, *Ramaswamy et al.* discloses a test corpus ("test text") is used by model checker 70 to evaluate the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory (column 3, lines 6 to 14; column 3, line 64 to column 4, line 7).

Concerning claim 6/5/3 and 6/5/4, *Ramaswamy et al.* discloses iterative corpus extractor computes a relevance score based upon a perplexity measure relative to a threshold to determine how many linguistic units to add to the language model (column 4, lines 7 to 54).

Response to Arguments

8. Applicants' arguments filed 10 September 2004 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1 to 6, 8, and 10 to 12 under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus")*, Applicants argue the reference fails to disclose or suggest the limitation of "a predefined criterion achieves a substantially minimum value". This position is traversed.

Klakow discloses the invention as claimed. On Page 1695, "2. Selecting Articles from a Corpus", *Klakow* says the selection criterion to be used to judge which articles to remove involves minimizing the perplexity of the test data. The unigram perplexity is equivalent to the log-likelihood, where the change in the log-likelihood when article A is removed from the training corpus is given by ΔF_i in Equation (1). (Pages 1695 to 1696:

2.1 The Unigram Selection Criterion) Thus, *Klakow* anticipates the limitation of "a predefined criterion achieves a substantially minimum value" by minimizing the perplexity of the test data. Identically, the Specification, Page 4, Lines 25 to 31, and Page 5, Lines 26 to 28, says that the selection criterion is a minimal perplexity.

Regarding the rejections of claims 7 and 9 under 35 U.S.C. 102(e) as being anticipated by *Ramaswamy et al.*, Applicants argue the references fail to disclose or suggest the limitation of "until a predefined criterion achieves a substantially minimum value". This position is traversed.

Ramaswamy et al. discloses an iterative language building technique where change in perplexity is minimized. Threshold comparator 63 accepts only those linguistic units that are below a perplexity threshold. (Column 4, Lines 15 to 54: Figure 3). Model checker 70 evaluates language model quality by using the size of the perplexity change. Model evaluator compares the perplexity score of the most recent iteration to perplexity scores from prior iterations. If the perplexity score for the current iteration is higher than those from prior iterations, indicating a reduction in quality, then the language model building process may be considered complete. If the current perplexity score is about the same as, or only slightly lower than prior scores, indicating no significant improvement in quality for the current iteration, then the language model building process may be considered complete. (Column 5, lines 6 to 34: Figure 4) That is, iterations continue if the perplexity score changes significantly in a manner that the perplexity is lowered, but the iterations stop if perplexity begins to increase or decrease only slightly. Thus, iterations continue until a predefined criterion, a size of perplexity

change, is minimized. Identically, the Specification, Page 4, Lines 25 to 31, and Page 5, Lines 26 to 28, says that the selection criterion is a minimal perplexity.

Regarding the rejections of claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, and 10 to 12 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, Applicants argue the references fail to disclose all of the elements of the claims. Applicants state *Ramaswamy et al.* discloses a reference language model is generated based on a small seed corpus containing linguistic units relevant to a domain, whereas *Bandara et al.* discusses the contents of a language model with respect to an acoustic distance.

However, Applicants' arguments amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references. Applicants have not pointed out specifically what language of the claims is not met by the combination of *Ramaswamy et al.* in view of *Bandara et al.*

Applicants are merely attacking the references individually without addressing the basis of the combination. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Therefore, the rejections of claims 1 to 6, 8, and 10 to 12 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus")*, of claims 7 and 9 are rejected under 35 U.S.C. 102(e)

as being anticipated by *Ramaswamy et al.*, of claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, and 10 to 12 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, and of claims 3, 4, 5/3, 5/4, 6/5/3, and 6/5/4 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, and further in view of *Klakow ("Language-model optimization by mapping of corpora")*, are proper.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Lerner whose telephone number is (703) 308-9064. The examiner can normally be reached on 8:30 AM to 6:00 PM Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (703) 305-9645. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

ML

ML
10/20/04

Vijay Chawan 10/28/04

VIJAY CHAWAN
PRIMARY EXAMINER